Center Independent Research & Development: GSFC IRAD

Visualization in Real-Time Experiment (VIRTEx)

Completed Technology Project (2013 - 2014)

Project Introduction

With the increase in quantity and complexity of launches at the Wallops Flight Facility (WFF) there is an ever-growing need for a more capable real-time visualization system for the WFF Range Control Center (RCC). This system should have the ability to depict the vehicle using actual CAD vehicle models, display vehicle attitude and stage separation events, and utilize robust network protocol suitable for real-time safety applications. This project will use existing WFF hardware systems and leverage past experiences and lessons learned to produce a Visualization in Real-Time Experiment (VIRTEx) application that will use a cutting edge message protocol for lab demonstration and use during real-time operations.

The objective of this project will be to migrate some of the outputs from the WFF Mission Planning Lab (MPL) into a real-time visualization system. The MPL is responsible for generating pre-flight RF margin link analysis, mission simulation & visualization, and other products for WFF missions. This real-time visualization system would depict in 3D graphics the position and orientation of the launch vehicle(s) or suborbital carrier (UAV, sounding rocket), VIRTEx would be expanded to use a more flexible publish/subscribe architecture, and the system will leverage recently developed advanced telemetry and data handling systems within the Range network.

Another main objective will be updating VIRTEx to support a sounding rocket mission which is scheduled to launch from NASA Wallops Flight Facility (WFF) in the summer of 2014.

This project will also be used to demonstrate the successful attitude data conversion from a WFF telemetry system. Updates are being finished on this telemetry system that convert various NASA Sounding Rocket attitude control systems (ACS) data formats. Multiple ACS systems output different data formats, so libraries and algorithms were added to the telemetry system to convert this data into a standard yaw, pitch, and roll dataset for Range Safety. VIRTEx will be able to easily show this data and will be able to compare it to the pre-flight attitude predictions.

Anticipated Benefits

This project benefits NASA missions because it can be used as a situational awareness display during launch operations at NASA Wallops Flight Facility (WFF). The result of this effort could eventually be incorporated into a larger mission graphics effort for WFF with additional funding and resources.

This project has the potential to benefit the commercial space industry during launch operations of a commercial launch vehicle. This system could be expanded and further tested to provide real-time support for all launch missions at NASA Wallops Flight Facility (WFF). Furthermore, this system could be leveraged at other launch ranges after minor modifications have been

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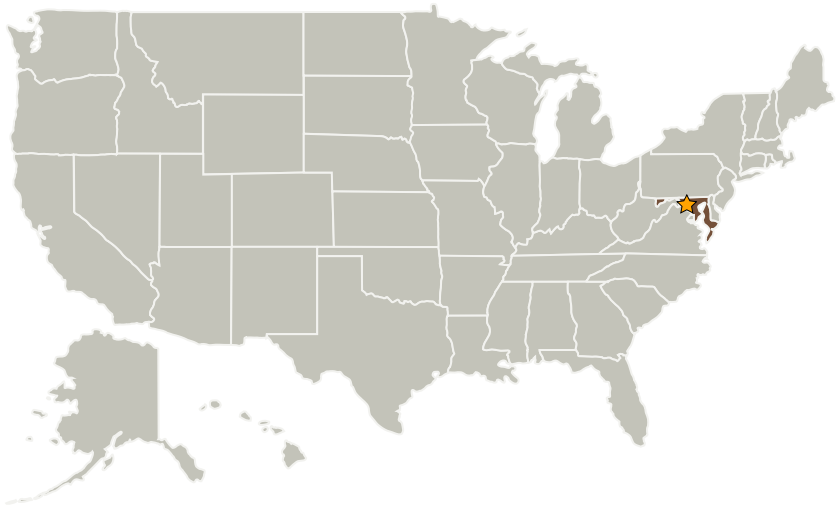
made to VIRTEx to account for different data formats. Subsequently, this project would further benefit commercial space by supporting more launch support.

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations
Maryland

Project Website:

http://aetd.gsfc.nasa.gov/

Organizational Responsibility

Responsible Mission Directorate:

Mission Support Directorate (MSD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Center Independent Research & Development: GSFC IRAD

Project Management

Program Manager:

Peter M Hughes

Project Manager:

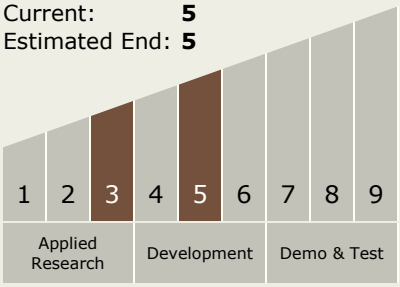
Jacqueline J Le Moigne

Principal Investigator:

Benjamin W Cervantes

Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**



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Technology Areas

Primary:

- TX13 Ground, Test, and Surface Systems
  - TX13.4 Mission Success Technologies
    - TX13.4.3 High-Fidelity Simulation and Visualization